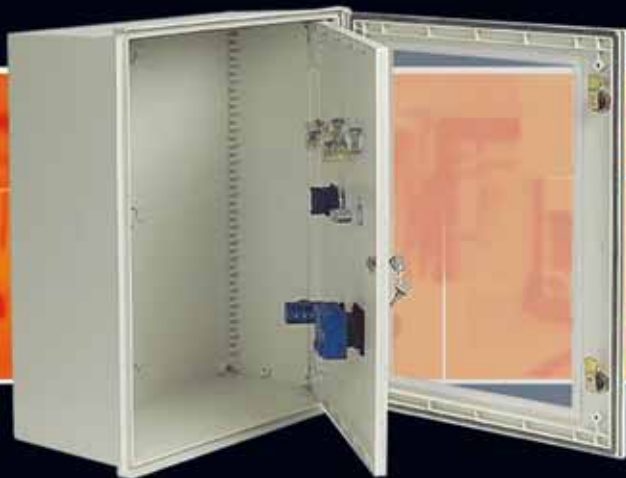


MOULDED POLYESTER ENCLOSURES **MINIPOL System**



HES

THE ENCLOSURES COMPANY



■ HES Group, the enclosures company

Founded in 1972, using the technological and human resources of Hazemeyer Española. This ambitious project was born to serve the increasing demands in the emerging electrical sector.

The HES Group has currently over 12.000 references, spread over 11 product ranges. The products give the system and enclosures market a wide range of solutions.

■ Research and Development

Our entire range of products and systems are the result of constant innovation in R&D.

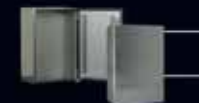
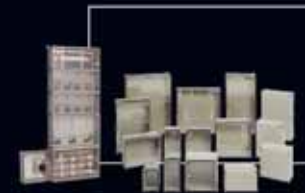
We can provide very competitive products in the market, which is becoming more and more demanding, thanks to our modern and automated production facilities and high quality standards.

■ Quality and Certification

One of the main objectives of the HES Group is to market products of the highest quality. Our products have therefore undergone the most demanding certification studies to validate this intention.

Our products undergo tests, which are designed to be as "real life" as possible before being put into production. Electrical, mechanical and other tests are made under extreme conditions such as very low and high temperatures. The products exceed the most stringent norms. Tests of our products are simultaneously made by national and international laboratories and the certifications are obtained from prestigious organizations from different countries endorse the products.

Products are systematically tested all along the production line, therefore guaranteeing the standard of quality.



THE ENCLOSURES COMPANY



THE MINIPOL RANGE

A system of cabinets made of hot moulded fibreglass reinforced polyester (GRP). The cabinets are halogen free. They can be used in all kinds of communication, electrical, pneumatical and hydraulical installations. The base is made in one piece, guaranteeing optimal availability in the interior and increasing the impact resistance. The cabinets offer optimal security for humans and animals because of the double isolation characteristics. The cabinets are available with opaque or transparent doors in 7 different sizes. They are symmetrical and reversible in many cases. The wide range of accessories gives an extra dimension to the Minipol range.

POLYESTER BETTER

CHARACTERISTICS OF THE MATERIAL

The cabinets are made of hot moulded fibreglass reinforced polyester (GRP). The cabinets are halogen free with a RAL 9002 grey as standard. The material's performance qualities are very high and the essential characteristics are the following:

- HIGH IMPACT STRENGTH
- SELF EXTINGUISHABLE
- DOUBLE ISOLATION
- CORROSION RESISTANT
- NO WATER ABSORPTION
- EASY TO MACHINE
- EASY AND FAST FITTING
- INSENSITIVE TO OUTDOOR ENVIRONMENT
- LIGHT

HIGH IMPACT STRENGTH



Can take hits up to 20 Joules, IK 10.

NON HYDROSCOPIC



Does not absorb water.

SELF-EXTINGUISHABLE



Does not feed the flames.

EASY AND FAST FITTING



Allows fast and easy fitting.

LIGHT



Comfortable and easy handling and installation.

DOUBLE ISOLATION



Provides an excellent protection against contacts.

CORROSION RESISTANT



Does not require any finishing or maintenance.

EASY TO MACHINE



No special tool is needed.

INSENSITIVE TO OUTDOOR ENVIRONMENT



Resistant to climate changes.

MINIPOL SYSTEM

MINIPOL CERTIFICATIONS

- PROTECTION DEGREE IP 66 according to the UNE 20324, EN 60529 and IEC 60529 norms.
- IMPACT RESISTANCE IK10 20 J according to the UNE-EN 50102 and IEC 62262 norms.
- SELF EXTINGUISHABLE 960° according to the UNE-EN 60695-2-1/0 and IEC 60695-2-10 norms.
- DOUBLE ISOLATION According to the UNE-EN 60439-1 and IEC 60439-1 norms.
- THERMIC CLASS E 150° according to the UNE 21305, EN-HD 566S1 and 60085 norms.



- APPROVALS AND CERTIFICATES

Applus⁺



MOUNTING

3 standard mounting systems; mounting brackets. Pole-mounting and on top of pole mounting. (on request)



BUILT-IN/SURROUNDING PROTECTION EDGE

- Guarantee the possibility to open the door 180° in built-in installations.
- Avoid entrance of water while opening the door.
- Guarantee that the cabinet is straight in comparison with the surface.



EASY TO MACHINE

Vertical patterns in the interior of the doors, which enables the correct fitting of devices.

MINIPOL SYSTEM



PERSONALIZED

Save installation costs requesting our pre-machining service. It is also possible to ask for personalized colours.

TWO TYPES OF DOORS

The Minipol system offers you two types of doors: opaque and transparent.

Opaque: permits the mounting of devices in the door.

Transparent: combined with mounting plate, chassis and/or internal door permits you to see meters, devices, lamps, etc. maintaining the levels of IP and security.

EASY FITTING

Quick fixture guides in the back. Permits fitting without drilling.



TOTAL FLEXIBILITY

The cabinets are possible to fit horizontally or vertically, obtaining endless combinations.

SECURITY

The chassis and interior door maintain an IP20 when the external door is open.



ROOM AND RESISTANCE

Single-block body, with even walls optimising the space and resistance.



INTERNAL ZAMAK INGE

180° door opening warranted. Corrosion free.

VARIOUS CLOSING SYSTEMS

Seven basic closing and locking systems. Whatever type of lock can be personalized to customer demand.



DIFFERENT APPLICATIONS

- MINIPOL it is a insulated enclosures system for a complete range of distribution regulation and control applications.
- Double insulation provides 100% security for the operations and maintenance team as well as a excellent performance, thanks to the synthetic material selection.
- This enclosures are the result of a polyester reinforced with fiber glass combination, for a long term reliability.

APPLICATIONS

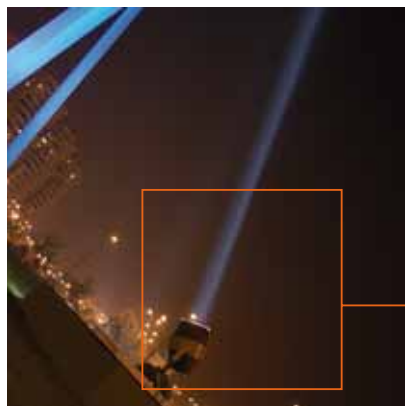
- Temporary installations.
- Electric panel control housing.
- Water pump electric control housing.
- Pull electric control housing.
- New energies electric control housing.
- Telecommunications electronic control housing.



Minipol in a skiing zone (extreme conditions).

MINIPOL

- Applied in the chemical and cement industry.



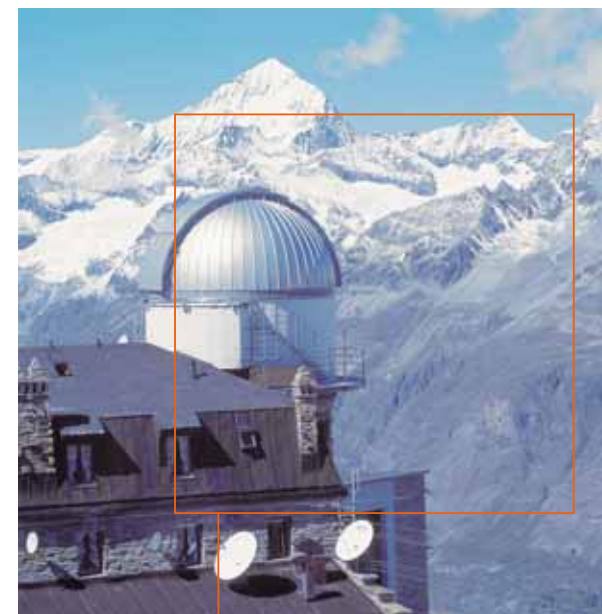
MINIPOL

- Applied for light, sound and hydraulical control etc.



MINIPOL

- Applied to regulate a water pump.



MINIPOL

- Applied in weather stations, astronomical and their communications.

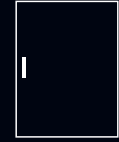
MINIPOL

- Applied in access control and security systems.



MINIPOL PRODUCT RANGE

MINIPOL SYSTEM



MEASURES (mm)

300 x 250 x 140

400 x 300 x 200

400 x 400 x 200

500 x 400 x 200

600 x 400 x 230

600 x 500 x 230

800 x 600 x 300



- Flat door
- Standard lock 2x double bit DIN 3.0 mm
- IP66

MIP-325
(1 double bar lock)

MIP-43

MIP-44

MIP-54

MIP-64

MIP-65

MIP-86



- Flat door
- Three point closing device, 1x double bit DIN 3.0 mm
- IP66

-

MIP-43/3P

MIP-44/3P

MIP-54/3P

MIP-64/3P

MIP-65/3P

MIP-86/3P



- Flat door
- Three point closing device with swing door, 1x double bit DIN 3.0 mm
- IP66

-

MIP-43/EKDB

MIP-44/EKDB

MIP-54/EKDB

MIP-64/EKDB

MIP-65/EKDB

MIP-86/EKDB



- Transparent door
- Standard lock 2x double bit DIN 3.0 mm
- IP66

MIP-325PT
(1 double bar lock)

MIP-43PT

MIP-44PT

MIP-54PT

MIP-64PT

MIP-65PT

MIP-86PT



- Transparent door
- Three point closing device, 1x double bit DIN 3.0 mm
- IP66

-

MIP-43PT/3P

MIP-44PT/3P

MIP-54PT/3P

MIP-64PT/3P

MIP-65PT/3P

MIP-86PT/3P



- Transparent door
- Three point closing device with swing door, 1x double bit DIN 3.0 mm
- IP66

-

MIP-43PT/EKDB

MIP-44PT/EKDB

MIP-54PT/EKDB

MIP-64PT/EKDB

MIP-65PT/EKDB

MIP-86PT/EKDB



MEASURES (mm)

300 x 250 x 140

400 x 300 x 200

400 x 400 x 200

500 x 400 x 200

600 x 400 x 230

600 x 500 x 230

800 x 600 x 300

- Polyester base plate
- 4 mm thickness

PBP-0325

PBP-0430

PBP-0440

PBP-0540

PBP-0640

PBP-0650

PBP-0860

- Metal base plate
- RAL 2000 colour
- 2 mm thickness

PBMP-0325

PBMP-0430

PBMP-0440

PBMP-0540

PBMP-0640

PBMP-0650

PBMP-0860

- Metal base plate
- Galvanized steel
- 2 mm thickness

PBMG-0325

PBMG-0430

PBMG-0440

PBMG-0540

PBMG-0640

PBMG-0650

PBMG-0860

- Metal base plate
- Zinced steel
- 2 mm thickness

PBMC-0325

PBMC-0430

PBMC-0440

PBMC-0540

PBMC-0640

PBMC-0650

PBMC-0860

- Perforated mounting plate (TELEQUICK)
- Galvanized steel plate
- Allows quick fixing of devices by using M4, M5 and M6 screw nuts

PBR-0325

PBR-0430

PBR-0440

PBR-0540

PBR-0640

PBR-0650

PBR-0860

- Adjustable and hinged polyester base plate
- Set of several mounting profiles for different depths and a hinged base plate of polyester

-

PGD-43

PGD-44

PGD-54

PGD-64

PGD-65

PGD-86

- Internal door
- Made of polyester

-

PI-43

PI-44

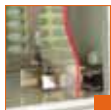
PI-54

PI-64

PI-65

PI-86

- see page 23





MEASURES (mm)

300 x 250 x 140

400 x 300 x 200

400 x 400 x 200

500 x 400 x 200

600 x 400 x 230

600 x 500 x 230

800 x 600 x 300



- Chassis for the fitting of modular devices
- Made of a chassis, die cast plates and DIN profiles for fixing of the devices
- see page 22

Number of modules
Number of files

-	MIP-43/CH24	MIP-44/CH36	MIP-54/CH54	MIP-64/CH54	MIP-65/CH69	MIP-86/CH116
-	24	36	54	54	69	116
-	2x12	2x18	3x18	3x18	3x23	4x29

-	-	-	-	-	-	MIP-86/CH145
-	-	-	-	-	-	145
-	-	-	-	-	-	5x29



- Spare parts:
 - Die cast plates
 - Knockouts for DIN Switchgear
 - For modular chassis
 - Plates in self-extinguishing insulating material

152 mm height cover
178 mm height cover
202 mm height cover

-	-	CC-400/152	CC-400/152	CC-400/152	CC-500/152	CC-600/152
-	CC-300/178	CC-400/178	CC-400/178	CC-400/178	-	CC-600/178
-	-	CC-400/202	CC-400/202	CC-400/202	CC-500/202	CC-600/202



- Spare parts:
 - Mounting plate for modular chassis
 - For the fixing of non-modular switchgear
 - Made of galvanised steel

152 mm height base plate
178 mm height base plate
202 mm height base plate

-	-	PB-400/152	PB-400/152	PB-400/152	PB-500/152	PB-600/152
-	PB-300/178	PB-400/178	PB-400/178	PB-400/178	-	PB-600/178
-	-	PB-400/202	PB-400/202	PB-400/202	PB-500/202	PB-600/202



- Pole mounting
- For external, provisional installations as construction sites or congresses
- Set of plates and adjustable clamps
- Brackets and profiles of galvanized steel

FP-250	FP-300	FP-400	FP-400	FP-400	FP-500	FP-600
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■ SURFACE MOUNTING

- Wall fixing set.
Directly to the wall by the means of head-insulated screws.
Ref. TF-MIP



- Set of adjustable brackets.
Set of 4 to every cabinet.
Ref. POF



■ SUPPORTING POLE

- For protection of incoming and outgoing cables.
Specially for off the ground installations, camping sites, marinas, etc.
Main support in stainless steel and PVC covers.
Easy fitting.



Supporting pole

Ref. PFS/MI

■ SCREW CLIPS

- To fix devices with the help of TELEQUICK.



Screw clip M4	Ref. CLIP-M4
Screw clip M5	Ref. CLIP-M5
Screw clip M6	Ref. CLIP-M6

■ ADJUSTABLE BASE PLATE

- Set of four profiles for the adjustment of the base plate, to different depths.
- Fast fixing to the cabinet.
- Made of galvanized steel.



Cabinet kit for MIP-43, MIP-44 and MIP-54	Ref. PDP-200
Cabinet kit for MIP-64 and MIP-65	Ref. PDP-230
Cabinet kit for MIP-86	Ref. PDP-300

■ SHUTTERS

- Set of shutters enabling partial covering of the window for automatic fuses.
- Fast fixing.
- Made of a self-extinguishing and isolating material.



Set of three pieces of one module two for 0.5

Ref. 0E-1



■ DERIVATION BAR

- Terminal bars for the derivation of the neutral and earth contact. Includes the bar and its support.

Terminal bars of 3 x 16 + 4 x 10 mm²

Ref. DPT1N



■ CLOSING PLATE

- Are used for the entrance of cables, cable glands etc.
- Made in polyester.

For 250 width	Ref. U-402
For 300 width	Ref. U-403
For 400/500 width	Ref. U-404



■ COUPLING PIECES

- Used for vertical or horizontal fitting of enclosures of same depth.
- Made in polyester.

VERTICAL FITTING

For 250 width cabinets	Ref. UM-420V
For 300 width cabinets	Ref. UM-430V
For 400/500 width cabinets	Ref. UM-440V

HORIZONTAL FITTING

For 300 height cabinets	Ref. UM-430H
For 400 to 800 height cabinets	Ref. UM-440H



■ VENTILATION DEVICE

- To allow ventilation in the cabinet.
- Made in Polyester.

Standard size RAL-9002

Ref. DV/C



Normal size RAL-7035

Ref. DVG



■ DRAIN VALVE

- Enabling drainage of possible condensation.
- Made in polyester.

For all types of boxes.

Ref. DP

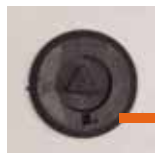
LOCKS MINIPOL



LOCKS

- Wide range of locks adaptable to the cabinets.
- The standard is the double bit lock.

■ Double bit DIN 3.0 mm.
Ref. PDB

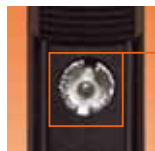


■ Triangular screw 11 mm.
Ref. PTT



- Manual with key lock.
Ref. PCM

■ Manual with key lock 3P.
Ref. PCM/3P



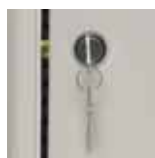
- Retractable closing with small pump double bar.
Ref. EKDB



- Stainless steel padlock in (PDB and PTT).
Padlocking device in zinc steel.
Ref. EC

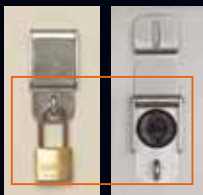
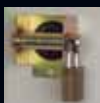
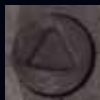


- Stainless steel padlock.
Ref. PCC



- Lock systems for the internal door.
Key lock.
Ref. CPI-LL

- Screw driver lock.
Ref. CPI-DE



CONFIGURA PERSONALISATION OF ENCLOSURE SERVICE

WE ADAPT TO YOUR REQUIREMENTS



Our cabinets and boxes can be personalized on demand. Adapted to your requirements of installation and mounting.

We process your enclosure with our automatic robot system. Making whatever perforation or mechanization on the front or side. Individual or multiple round, square or special holes. You can get what you need in all our cabinets and boxes. Adapting ourselves to your needs so that you can lower your production and handle costs.

Whatever box or cabinet can be made in whatever color you might need, depending on the needs in the installation area.
For short production lines or for long lines.

The difference in price between a standard product and a non-standard can be minimal in a long production line.

In function of our new production system, the delivery times do not change considerably in comparison with the standard product.

Send us a drawing with your requirements to: configura@hes.es, fax us on (+34) 93 384 35 86 or call us on (+34) 93 389 42 62. We will shortly contact you with a quotation.



THE ENCLOSURES COMPANY

CHASSIS FOR THE INSTALLATION OF MODULAR SWITCHGEAR

- A chassis system has been developed for modular switchgear. It is supplied in a kit, which permits quick fitting and quality.

KIT ADVANTAGES

- All fitting and cabling is made on the outside of the cabinet, which makes maintenance extension easier.
- The fixing of the whole cabinet set is quick, simple and safe.
- The support rails of the modular switchgear can be regulated to seven different heights.
- Base plates and die cast plates are available for non-modular switchgear.

KIT COMPOSITION

- The kit composes of all the necessary pieces to make the mounting of the modular switchgear, with the maximum number of rows depending on the height of the cabinet. The pieces are the following:
 - 2 lateral pieces.
 - One support profile for every row of modular switchgear.
 - One bracket for every support profile.
 - 4 bases for the fitting of the chassis inside the cabinet.
 - 4 metallic inserts for the fixing of the bases.
 - 1 die cast plate for every for every support profile.
 - All the necessary screws for the installation.
 - Accessory (base plate).

COVERS

- Covers included in the kit have two purposes: keeping IP with open doors, and good aesthetic performance.
- The design system and chassis assembly, allows with the same pieces included in the kit; with no need to make any mechanization, changes in distances between switchgear or, offering greater or smaller space for wiring.
- The diverse assemblies that can be made are indicated in the kit assembly Instructions.

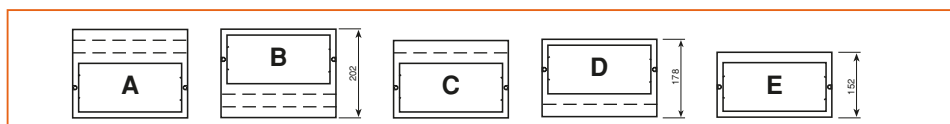


INTERNAL DOOR

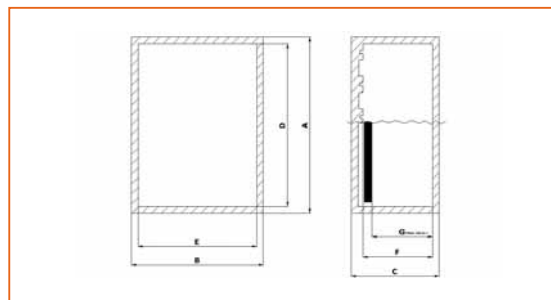
- For the fixing of signal and measurement elements. The protection grade and the double isolation of the cabinet are kept intact. Event though the accessories and the fixing parts are of metal.
- This unit comes in a kit, to be fitted into the cabinet by the user.
- The fixing of the unit is fast, simple and safe.
- Permits the installation of the fixed base plate. The adjustable plates and the modular switchgear cannot be used.
- The internal door can be hinged on both sides. This means that the door can be put on the right or left side. The door opens 90° and is marked in the interior, making mechanization and fitting of signal lamps, pushbuttons etc easier.
- The internal door's closing system is done with a lock and key to hinder unauthorized people (Other kinds of locks can be ordered).

KIT COMPOSITION

- The kit has all the pieces necessary to fit the internal door:
 - 4 inserts for the fixing of the set.
 - Closing profile with screws and fixing rings, fitted to the inserts.
 - Internal door with hinges and locking device with corresponding screws and fixing rings for the locking profile.

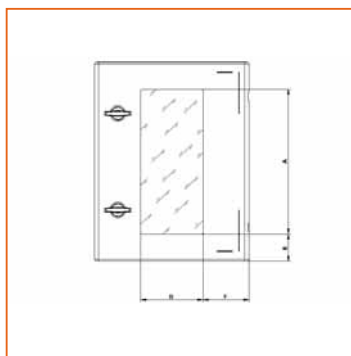


CABINET DIMENSIONS



DIMENSIONS mm							
TYPE	A	B	C	D	E	F	G
MIP-325	300	250	140	276	212	120	110
MIP-43	400	300	200	370	262	180	170
MIP-44	400	400	200	370	362	180	170
MIP-54	500	400	200	470	362	180	170
MIP-64	600	400	230	570	362	210	200
MIP-65	600	500	230	570	462	210	200
Mip-86	800	600	300	770	562	280	270

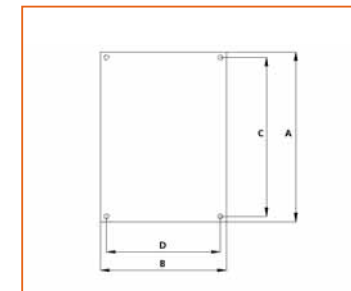
TRANSPARENT DOOR



DIMENSIONS mm				
TYPE	A	B	E	F
MIP-325	220	115	35	75
MIP-43	281	141	52	80
MIP-44	281	221	52	90
MIP-54	381	221	52	90
MIP-64	481	221	52	90
MIP-65	481	321	52	90
Mip-86	681	421	52	90

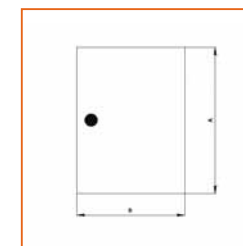
BASE PLATE

DIMENSIONS mm				
TYPE	A	B	C	D
MIP-325	268	213	248	175
MIP-43	358	260	338	222
MIP-44	358	360	338	322
MIP-54	458	360	438	322
MIP-64	558	360	538	322
MIP-65	558	460	538	422
Mip-86	754	556	734	518

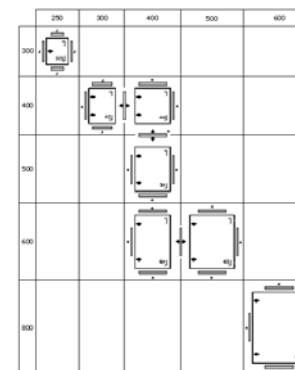


INTERNAL DOOR

DIMENSIONS mm		
TYPE	A	B
MIP-43	366	258
MIP-44	366	358
MIP-54	466	358
MIP-64	566	358
MIP-65	566	458
MIP-86	766	558



FITTING OF CABINETS



FITTING	TYPE
2 vertical coupling 250 mm wide	UM-420V
3 vertical coupling 300 mm wide	UM-430V
4 vertical coupling 400/500 mm wide	UM-440V
3 horizontal coupling 300 mm high	UM-430H
4 horizontal coupling 400/500/600/800 mm high	UM-440H

FITTING

- The Minipol range permits several cabinets to be fitted together with the help of coupling pieces.



DEGREES OF PROTECTION ACCORDING TO UNE 20324 IEC-EN 60529

FIRST CHARACTERISTIC NUMERAL

- Protection of people against access to hazardous parts (see additional letter) and protection against solid foreign objects.

IP	SOLID FOREIGN OBJECTS	ACCESS TO HAZARDOUS PARTS	DESCRIPTION
0			Non-protected.
1			Protected against solid foreign objects of 50 mm Ø and larger (i.e. the back of the hand).
2			Protected against solid foreign objects of 12.5 mm Ø and larger (i.e. with a finger).
3			Protected against solid foreign objects of 2.5 mm Ø and larger (i.e. access to hazardous parts with a tool).
4			Protected against solid foreign objects of 1.0 mm Ø and larger (i.e. access to hazardous parts with a wire).
5			Dust intake is not totally prevented, but dust shall not penetrate in such a quantity to interfere with satisfactory operation of the apparatus or to impair safety.
6			Dust-tight. No dust-intake.

ADDITIONAL LETTER

- If the actual protection against access to hazardous parts is higher than that indicated by the first characteristic numeral.

LETTER	SIGNIFICANCE
A	 Protected against access with the back of the hand. The access probe, sphere of 50 mm Ø shall have adequate clearance from hazardous parts.
B	 Protected against access with a finger. The jointed test finger of 12 mm Ø, 80 mm length shall have adequate clearance from hazardous parts.
C	 aProtected against access with a tool. The access probe of 2.5 mm Ø, 100 mm length shall have adequate clearance from hazardous parts.
D	 Protected against access with a wire. The access probe of 1.0 mm Ø, 100 mm length shall have adequate clearance from hazardous parts.

SECOND CHARACTERISTIC NUMERAL

- Protection against harmful intake of water.

IP	TEST	DESCRIPTION
0		Non-protected.
1		Protected against vertically falling water drops
2		Protected against vertically falling water drops when enclosure is tilted up to 15°.
3		Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects.
4		Water splashed against the enclosure from any direction shall have no harmful effects.
5		Water projected in jets against the enclosure from any direction shall have no harmful effects.
6		Protected against powerful water jets.
7		Protected against the effects of temporary immersion of water.
8		Protected against the effect of continuous immersion of water

SUPPLEMENTARY LETTERS

- To provide ulterior information on the material.

LETTER	SIGNIFICANCE
H	High-voltage apparatus.
M	Tested for harmful effects due to water intake when the movable parts of the equipment (e.g. the rotor of the rotating machine) are in motion.
S	aTested for harmful effects due to water intake when the movable parts of the equipment (e.g. the rotor of the rotating machine) are stationary.
W	Suitable for use under specified weather conditions and provided with additional protective features or processes.

GUIDELINE FOR THE USE OF INDEX PROTECTION DEGREES

FIELD OF USE	IP43/44	IP55/67
<ul style="list-style-type: none"> AGRICULTURE 	Mobile or portable equipment or appliances used or stored in sheltered premises.	Outdoor installation of pumping, ventilation, drying equipment.
<ul style="list-style-type: none"> CHEMICAL INDUSTRY 	Indoors in premises for storage and maintenance purposes where connections are not exposed to the risk of immersion or chemicals.	On premises without risk of explosions but where the connections are exposed to chemicals and subject to possible immersion.
<ul style="list-style-type: none"> CONSTRUCTION SITES AND SHIPYARDS 	Covered construction sites sheltered against weathering though exposed to splashing water.	In outdoor construction sites where the connections are left on humid ground exposed to freezing, dust and weathering.
<ul style="list-style-type: none"> SPORTS COMPLEXES AND OTHER PLACES OF PUBLIC ENTERTAINMENT, TV AND FILM STUDIOS 	In sheltered premises protected against the weather, though exposed to splashing, without high-connected loads.	Outdoor systems exposed to rain, snow, mud, freezing and other critical weather conditions, where high load for lighting installations, TV or audio is expected.
<ul style="list-style-type: none"> FOOD INDUSTRY 	In sheltered locations, in indoor premises serving for storage and maintenance.	In locations subject to washing by hosing down and where connections are subject to heavy duty.
<ul style="list-style-type: none"> HEAVY INDUSTRY 	In sheltered storehouses, workshops for maintenance, minor assembly and moulding.	In rolling mills, foundries, blast furnaces, etc., where the connections are exposed to dust, metal swarf, coolants and are subject to vibrations and impact.
<ul style="list-style-type: none"> LIGHT INDUSTRY 	Locations without high humidity or ambient pollution serving for assembly, moulding, maintenance and storage.	On premises subject to cleaning by means of chemical solvents. Also where heavy loads require high safety in connections.
<ul style="list-style-type: none"> INSTALLATIONS FOR EDP CENTRES 	Electrical connections executed above floor level.	Electrical connections executed under raised floors with risk of immersion. Where heavy loads require high safety in connections.
<ul style="list-style-type: none"> PORTS 	In sheltered locations such as docks, repair shops, offices etc.	Quays, docks, piers, etc. Where there is risk of high waves and partial flooding.
<ul style="list-style-type: none"> AIRPORTS 	In sheltered locations, hangars, repair shops, storehouses.	Outdoors for the connection between mobile or portable appliances and aircraft
<ul style="list-style-type: none"> WATER TREATMENT PLANTS 	Indoor use in repair shops, etc.	In all locations with risk of flooding and for outdoor use with pumps, aeration and ventilation systems.

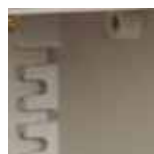
PLASTIC MATERIALS

- Plastic materials are used for many applications. Finished products are obtained by using heating processes. They have a molecular structure (made) of long chains of polymers created by the interaction of several molecules (monomers) or pair of molecules. Distinction between thermoplastics and thermo sets has to be made.



THERMOPLASTICS

- Its transformation is carried out by hot mould injection. The obtained pieces of thermoplastic, can be moulded a number of times. Most thermoplastics are soluble in normal organic solvents.



THERMOSETS

- Its transformation is carried out by hot mould compression. Finished products cannot be remoulded and they are insoluble, due to the particular molecular structure. This type of plastic cannot be hot welded and is practically insoluble in most solvents found on the market. In some cases, it is possible to use specific solvents.

PLASTICS ADVANTAGES

- Double insulation gives perfect safety against direct and indirect contacts.
- Frame does not need earthing.
- Unlike metal, plastic does not rust.
- Enclosures are homogeneous, no maintenance is required.
- Because of its lightweight plastic enclosures can be easily machined, handled and installed.

PLASTICS TECHNICAL DATA

PROPERTIES	NORM	UNIT	POLYESTER	POLYCARBONATE	POLYPHENYLENE	POLYAMIDE
MECHANICAL						
Impact strength	ISO 179	KJ/m ²	55	No rupture	40	40
Notched impact strength	ISO 179	KJ/m ²	55	30-50	15	25
Flexural strength	ISO 178	MPa	150	No rupture	No rupture	No rupture
Tensile strength	ISO 3268	MPa	50-60	65-70	37	60
ELECTRICAL						
Tracking resistance	IEC 112	V/50dr	KC600	KC200	KC175	KC600
Surface resistivity	IEC 93		12	15	> 12	12
Special resistivity	IEC 93	Ω·cm	> 1012	> 1016	> 1014	> 1012
Dielectric strength	IEC 243	kV/mm	18	35	16	34
PHYSICAL						
Deflection temperature	ISO 75/A	°C	> 250	135	95	60
Vicat softening point	ISO 306/B50	°C		145-150	109	210-220
Temperature resistance	Continuous	°C	-50 a + 150	-50 a + 130	-50 a + 100	-40 a + 100
Tropicalization and resistance to mold and fungus growth			No degradation	No degradation	No degradation	No degradation
Water absorption	ISO 62/1 96h	mg	45	10	7	320
Density	ISO R1183	Kg/dm ³	1.75	1.2	1.1	1.14
FLAME RESISTANCE						
Limit oxygen index	ISO 4589	%O ²	26	24,3	27,5	23
Flammability	UL 94 3 mm		94HB	94V2	94V1	94V2
Hot wire resistance	IEC 695 2-1	°C	960	850	960	650
Toxicity of fumes	ISO 04615	%Cl	Halogen-free	Halogen-free	Halogen-free	Halogen-free

COMPABILITY OF PLASTIC MATERIALS WITH CHEMICAL COMPOUNDS


CHEMICAL ENVIRONMENT	POLYAMIDE	POLYCARBONATE	POLYESTER	CHEMICAL ENVIRONMENT	POLYAMIDE	POLYCARBONATE	POLYESTER
Acetic acid 10%	R	R	R	Hydraulic fluid	R	L	R
Acetic acid 50%	L	L	R	Hydrazine	U	U	-
Acetone	R	U	U	Hydrobromic acid	L	-	L
Aluminium chloride	L	R	R	Hydrochloric acid 10%	L	L	L
Aluminium sulphate	L	R	R	Hydrofluoric acid 10%	L	R	L
Aluminium hydroxide 10%	U	U	U	Hydrogen peroxide 30%	-	R	R
Ammonia	U	U	L	Hydrogen sulphide	L	R	R
Aniline	U	U	U	Isopropyl alcohol	R	R	R
Amyl acetate	-	U	L	Jet aircraft fuels	R	L	R
Amyl alcohol	-	L	L	Kerosene	R	R	R
Antifreeze	-	L	R	Lacquers	-	R	L
Aqua regia	-	L	U	Lactic acid 10%	L	R	R
Benzene	R	U	L	Magnesium chloride	L	R	R
Benzoic acid	L	U	L	Methyl alcohol	R	L	L
Boric acid	L	U	L	Methyl ethyl ketone	R	U	L
Brake fluid	-	L	L	Methylene chloride	R	U	U
Bromine	-	U	U	Mineral oils	L	R	R
Butyl acetate	-	U	L	Naphta	-	R	R
Butyl alcohol	R	R	R	Nitric acid 10%	L	R	L
Butyl ether	-	U	L	Nitrobenzene	L	U	L
Butylic acid	L	U	L	Oleic acid	L	R	R
Calcium chloride	R	R	R	Oleum	U	-	U
Calcium hydroxide	U	-	L	Oxalic acid 10%	L	R	R
Calcium nitrate	L	R	R	Oxygen	L	R	R
Carbon dioxide	L	-	R	Ozone	-	U	L
Carbon disulphide	R	U	L	Perchloroethylene	R	-	U
Carbon monoxide	L	-	L	Petroleum ether	-	R	R
Carbon tetrachloride	R	U	L	Phenol	L	U	U
Chlorine	L	L	L	Phosphoric acid 25%	L	L	L
Chlorobenzene	R	U	U	Phthalic acid	L	-	R
Chloroform	R	U	U	Potassium chloride	-	R	R
Chromic acid 10%	U	R	L	Potassium dichromate	U	-	L
Citric acid 5%	R	R	R	Potassium hydroxide 10%	L	U	U
Clorox	-	R	L	Potassium nitrate	L	R	R
Copper chloride	L	R	-	Potassium permanganate 10%	U	R	L
Copper sulphate	L	R	L	Pyridine	L	U	-
Cresol	U	U	U	Sodium bicarbonate	U	R	R
Crude oils	L	-	L	Sodium bisulphate 10%	-	R	R
Diesel fuels	-	R	R	Sodium carbonate 10%	U	R	R
Dimethyl sulfoxide	U	U	-	Sodium chlorate 10%	-	R	R
Dimethyl formamine	U	U	L	Sodium chloride 10%	L	R	R
Dioxane	-	U	L	Sodium hydroxide 10%	R	U	L
Ethyl acetate	R	U	L	Sodium hypochlorite 10%	U	R	L
Ethyl alcohol	R	L	R	Sodium nitrate	L	U	R
Ethyl ether	R	U	R	Sulphur dioxide	L	L	R
Ethyl chloride	R	U	L	Sulphuric acid	L	L	L
Ethyl dichloride	R	U	U	Tartaric acid	L	R	R
Ethylene glycol	L	R	R	Tetrahydrofuran	-	U	U
Ethylene oxide	-	R	R	Toluene	L	U	L
Ferric chloride	L	R	R	Trichloroacetic acid	-	R	U
Formaldehyde 37%	L	R	R	Trichloroethane	-	U	L
Formic acid 10%	R	R	L	Trichloroethylene	L	-	L
Freon 113	-	L	R	Trisodium phosphate	U	L	-
Freon 22	-	U	L	Turpentine	-	L	R
Freon TF	L	L	L	Water	R	R	R
Gasoline	R	L	R	Xylene	-	U	L
Helium	U	-	R	Zinc chloride	L	R	R
Heptane	R	R	R	Zinc sulphate	L	R	R
Hexane	-	L	R				

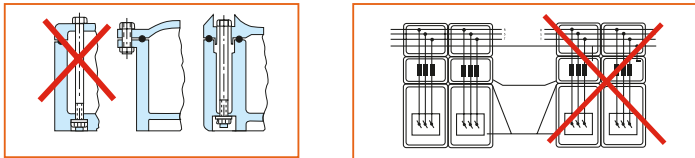
R=Recommended; L=Limited; U=Unsatisfactory

PROTECTION AGAINST ELECTRIC SHOCK

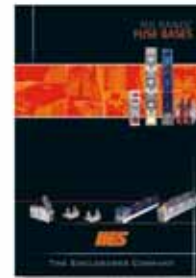
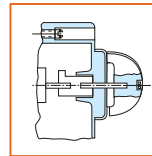
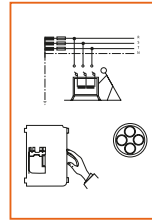
- In the "Low Voltage Directive" and in all International, European and Spanish electrical norms, are specified different protection systems against the direct and indirect contacts, for the safety of people and animals.
- Of all different protection systems accepted by these norms, we shall point out the protection system named "by total insulation" or "double insulation" which is equivalent to "materials class II".
- The following section explains the assurances detailed in the norms for this protection system category.

PROTECTION BY TOTAL INSULATION

- a)** The apparatus shall be completely enclosed in insulating material. The enclosure carries the symbol  which shall be visible from outside.
- b)** The enclosure shall be made of an insulating material which is capable of withstanding the mechanical, electrical and thermal stresses to which it is likely to be subjected under normal or special service conditions and it shall be resistant to ageing and shall be flame resistant.
- c)** At no point shall the enclosure be penetrated by conducting parts so that there is a possibility of touching internal live parts so as to expose a fault voltage. This means that the metal parts, such as actuator shafts, which for structural reasons have to be brought through the enclosure, shall be insulated on the inside or the outside of the enclosure from the live parts for the maximum rated insulation voltage and, if applicable, the maximum rated impulse withstand voltage of all circuits in the assembly. If an actuator is made of metal (whether covered by insulating material or not), it shall be provided with insulation rated impulse withstand voltage of all circuits in the assembly. If an actuator is principally made of insulating material, any of its metal parts which may become accessible in the event of insulation failure, shall also be insulated from live parts for the maximum rated insulation voltage and, if applicable, the maximum rated impulse withstand voltage of all circuits in the assembly.



- d)** The enclosure, when the assembly is ready for operation and connected to the supply, shall enclose all live parts exposed, conductive parts and parts belonging to a protective circuit in so that they cannot be touched. The enclosure shall at least give an IP3XD protection. If an external protected conductor is to be connected to electrical equipment on the load side of the assembly, and to be passed through an assembly whose exposed parts have been insulated, the necessary terminals for connecting the external protective conductors shall be provided, together with suitable identification. Inside the enclosure, the protected conductor and its terminal shall be insulated from the live parts and the exposed conductive parts in the same way as the live parts are insulated.
- e)** Exposed conductive parts within the assembly shall not be connected to the protected circuit i.e. they shall not be included in a protective measure involving the use of a protected circuit. This applies also to built-in apparatus even if they have a connecting terminal for a protected conductor.
- f)** If doors or covers of the enclosure can be opened without the use of key or tool, an obstacle of insulating material shall be provided which will provide protection against unintentional contact, not only with the accessible live parts, but also with the exposed conductive parts which are only accessible after the cover has been opened; this obstacle, however, shall not be removable except with the use of tool.



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